

fingerprint door lock arduino using servo motor

by kisheean raaj

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Arduino UNO Fingerprint Door lock

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Abstract

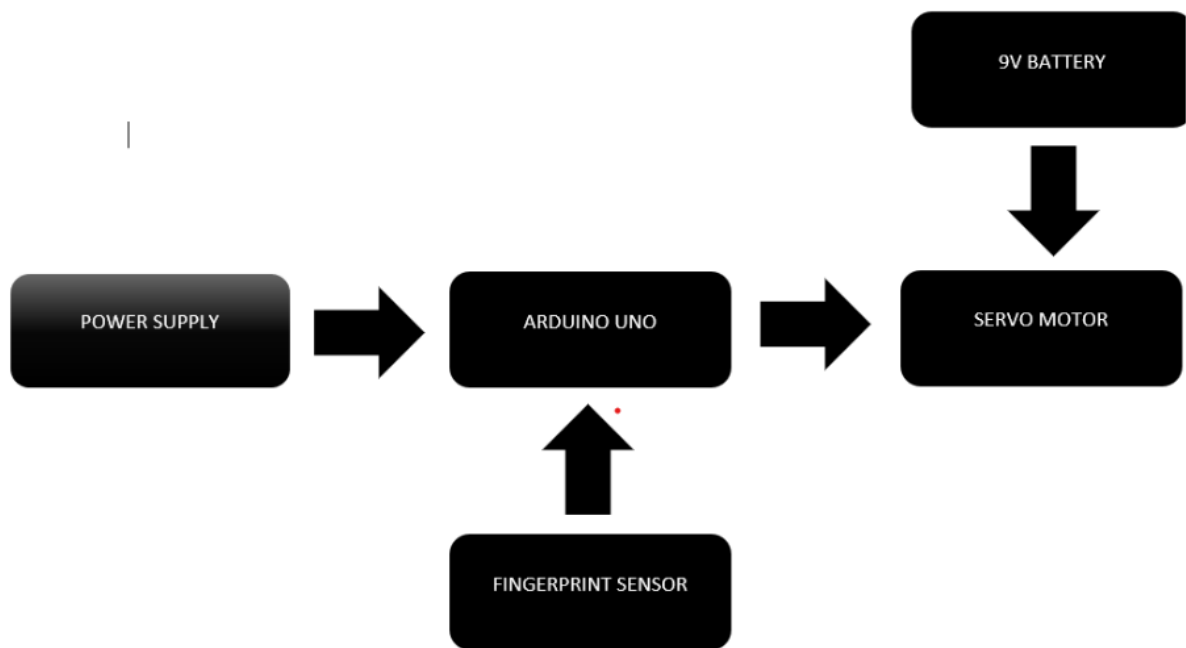
In today's world, the first thing that matters is protection, be it offices, labs, school or home. To make your details, money, premises and personal belongings safe and secure from unauthorized individuals. This paper represents a biometrics framework for finger print recognition based on a real-time embedded system that will have a full security solution and render unauthorized people unable to access it. In contrast to the other RFID authentication methods, this method has proven to be the most effective and reliable password protection. The nature of this scheme will strictly preclude unauthorized access. The device stores and only gives access to the fingerprints of registered individuals. A sensor that can be linked with Arduino to validate for authentication performs fingerprint recognition. If the fingerprint of the consumer is a positive match, the door will unlock.

Introduction

This paper is about addressing the safety issue of unauthorized persons trespassing in our homes, shops or workplaces. Safety problems may be solved using conventional locks, but with the use of duplicate keys, there is still the risk of someone opening the lock without damaging it. If we lose keys, using these types of locks often causes issues and we still have to bring keys along with us. Again, it can improve protection by using patterns in the locks, but it can be opened again if the passwords or patterns are identified somehow. So we will introduce a scheme using biometrics, leaving every device in this project. The pattern that will be used as the key will be special in the case of biometrics. Here, we will use a fingerprint as the key to execute the project. This Arduino project will use various devices to implement the security lock, where different features will be available to increase the level of protection.

Methodology

BLOCK DIAGRAM



This is the block diagram of this project.

FLOWCHART

1

Fingerprint biometric technology provides high level of recognition accuracy. The skin on our palms and soles exhibits a flow like pattern of ridges called friction ridges which makes fingerprint so unique identification for everyone. R305 scans the fingerprints of users and uses for ensuring authentication and follow the necessary steps as shown in this picture.

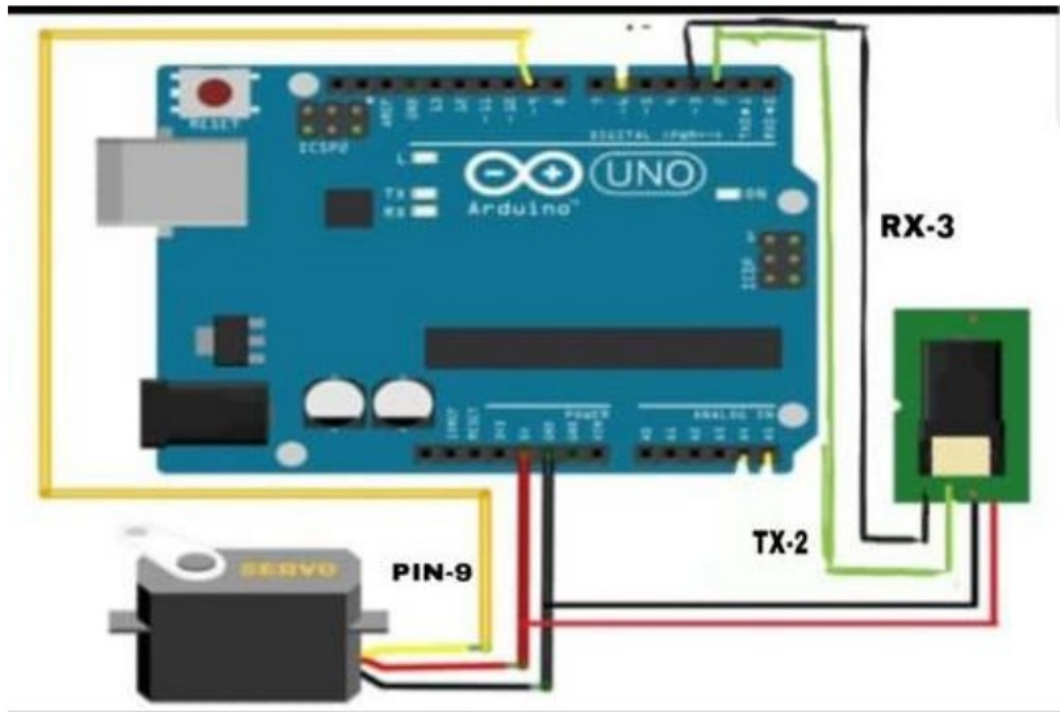


1

Monitoring Arduino Reading

Arduino allows users to track different Arduino sensors, enabling users to monitor different types of sensors in real time, such as finger print sensors and motion detectors. It has 14 digital input/output pins, 6 analog inputs, a USB connection, a power jack, a reset button (of which 6 can be used as PWM outputs). An analog-to-digital converter (ADC) is included in the ATmega328 microcontroller embedded on the Arduino board, converting the analog input signal to a number between 0 and 1023. The Arduino board's analog and digital pins will act as GPIO (General Purpose Input and Output Pins). The integer number is typically always proportional to the amount of voltage applied to the analog input. Any 5-volt sensor can be directly linked to the Arduino board. The biometric prototype was applied on the panel.

CIRCUIT DIAGRAM



This is the circuit diagram for this project. Firstly, connect the fingerprint sensor to the Arduino board. Connect the red wire to 5V, then black wire to to GND, connect TX to pin 2, and RX to pin 3. Later on , connect the servo motor. Connect the red wire to 5V, then the black wire to GND and the orange wire to pin 9. Add a 9V battery to the servo motor.

COMPONENTS

ARDUINO UNO

The Arduino Uno is an open-source microcontroller board created by Arduino.cc based on the Microchip ATmega328P microcontroller. The board is fitted with digital and analog input/output pin sets that can be attached to different expansion boards and other circuits.



FINGERPRINT SENSOR

Fingerprint sensors are biometric authentication devices. They are now used in police stations, in the defense industry and, most recently, on smartphones. On their fingertips, everybody has patterns of friction ridges, and it is this pattern that is called the fingerprint.



SERVO MOTOR

A servomotor is a rotary actuator or linear actuator that allows angular or linear position, velocity and acceleration to be controlled accurately. It consists of an appropriate motor for location input, coupled to a sensor.



DC ADAPTER

An AC adapter, otherwise referred to as an AC/DC adapter, AC converter or charger, is an external power supply used by devices that run on batteries or have no other power source. By eliminating the need for a regular sized power supply, AC adapters help minimize the size of a laptop computer.



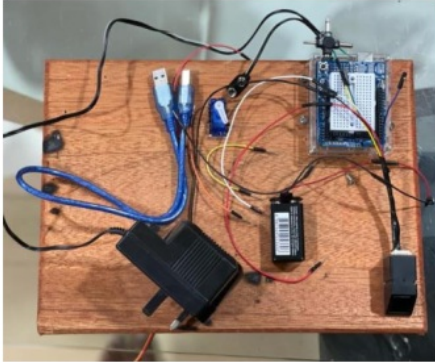
BATTERY

When a battery provides electrical power, the cathode is the positive terminal and the anode is the negative terminal.



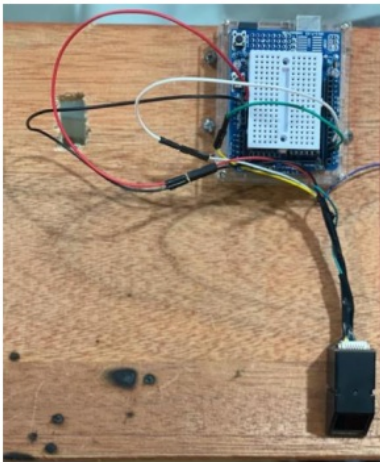
PROCEDURE

First Step



Firstly, you must have all of these things to do in this project. You need a Arduino(UNO), Fingerprint sensor, USB cable, DC Adapter, 9V Battery, Jumper wires, and a servo motor. You also need a device to upload the coding inside the Arduino(UNO).

Second Step

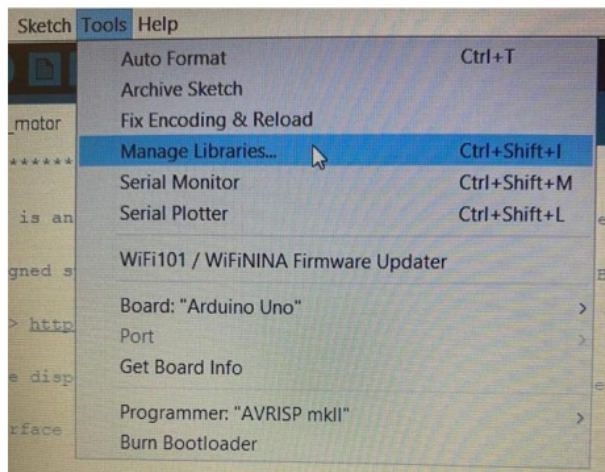


Secondly, connect the fingerprint sensor to the Arduino(UNO) board. Connect the red wire to 5V, the black wire to GND, the green wire/TX to pin 2, and the white wire/RX to pin 3. Later on, connect the USB Cable to a PC or a laptop to verify and upload the coding.

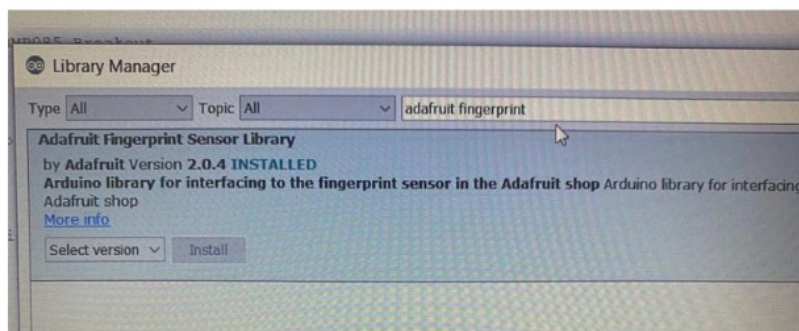
Third Step



Download this software in your laptop or PC. This is to upload the coding inside the Arduino(UNO) board.

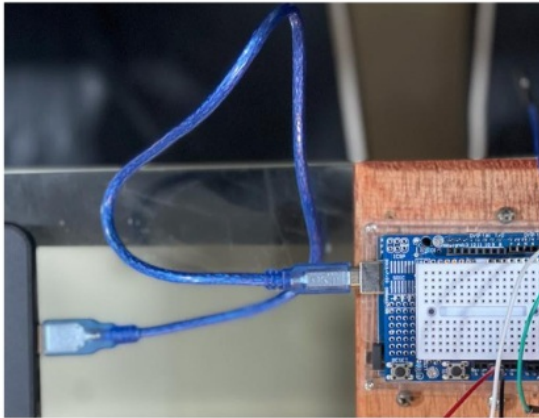


After downloading the software, go to tools and click the “Manage Libraries”.

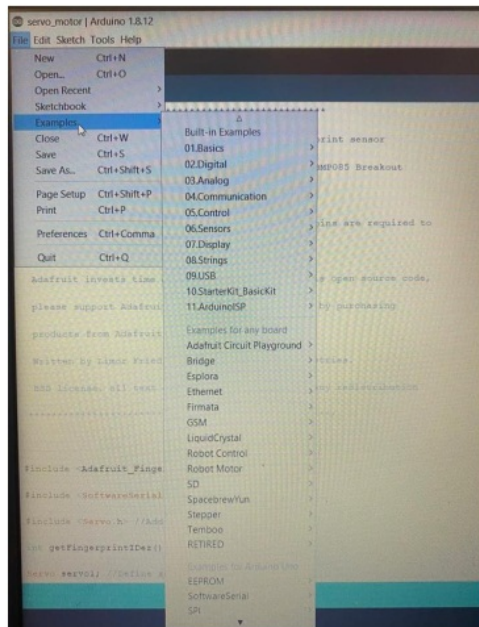


Later on, search for “Adafruit Fingerprint Sensor Library”. Make sure you install it.

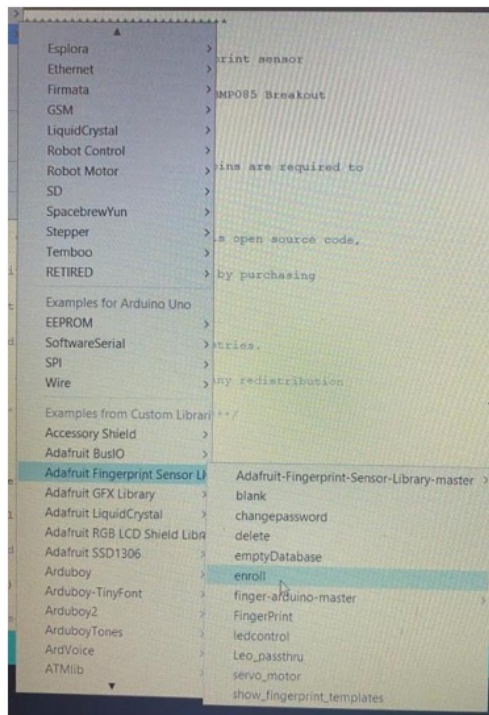
Fourth Step



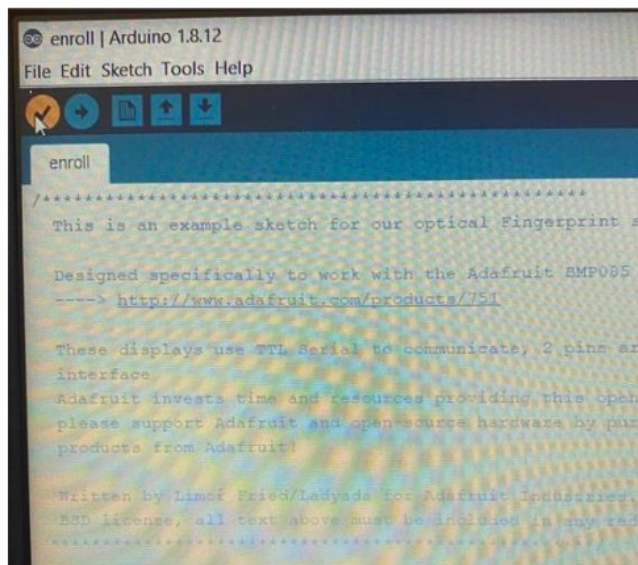
Plug in the USB cable into a laptop or a PC.



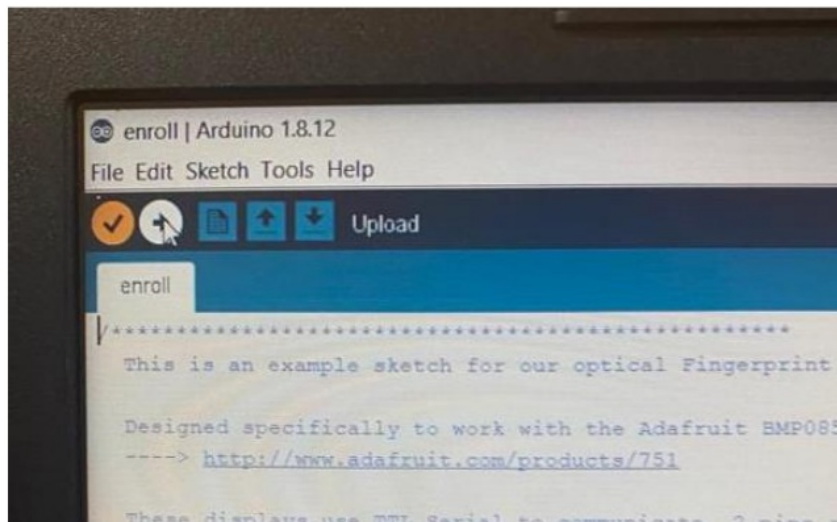
Then, go to file - example – Adafruit Fingerprint Sensor Library



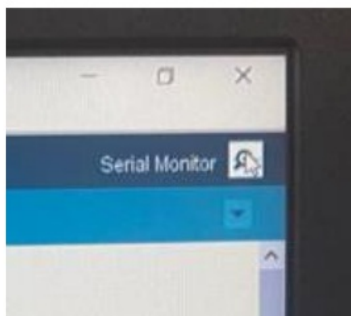
Later on, click on the “enroll”



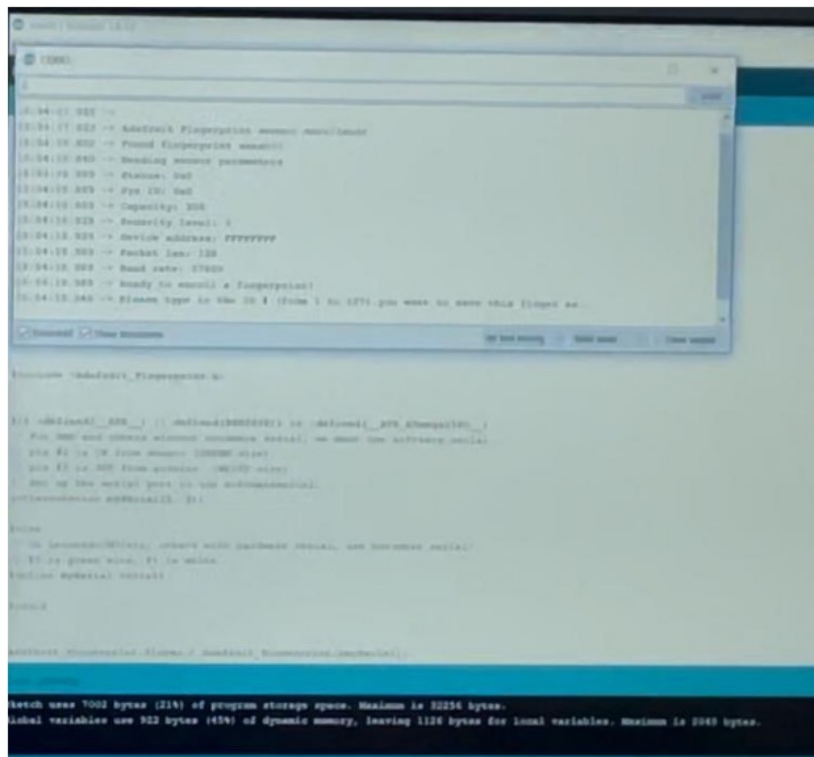
Then, click the on the verify ✓



And then click on the “Upload” ➡



After uploading click on the “serial monitor” to look at output.

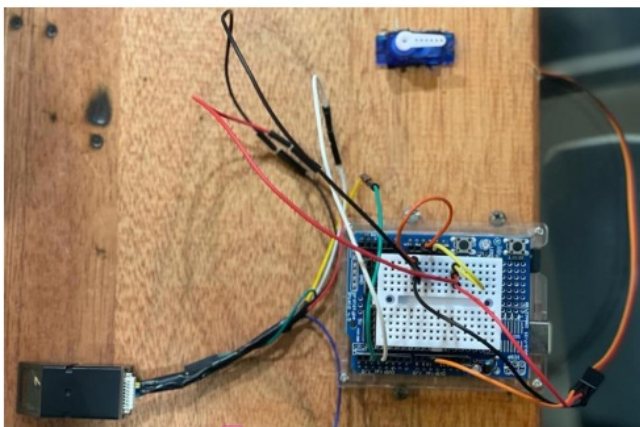


```
10:54:11.000 ->
10:54:11.022 -> Address Fingerprint sensor successfully
10:54:11.040 -> Found fingerprint sensor!
10:54:11.060 -> Sending sensor parameters
10:54:11.080 -> Device ID: 0x0
10:54:11.100 -> Capacity: 32K
10:54:11.120 -> Device ID: 1
10:54:11.140 -> Device address: 0x000000
10:54:11.160 -> Device ID: 128
10:54:11.180 -> Device ID: 0x000
10:54:11.200 -> Ready to send a fingerprint!
10:54:11.240 -> Please type in the ID # (from 1 to 127) you want to send this fingerprint to.

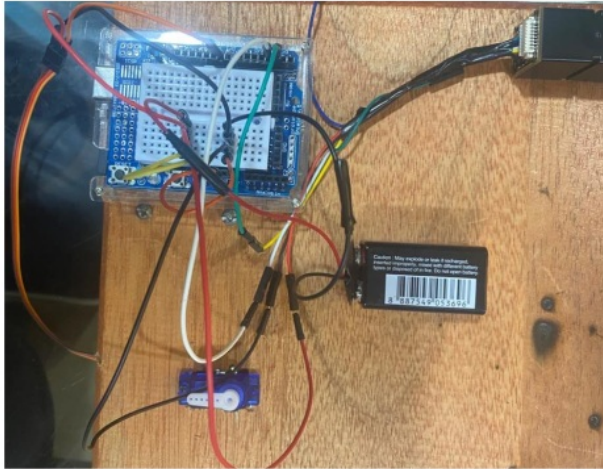
Sketch uses 7002 bytes (21%) of program storage space. Maximum is 32256 bytes.
Global variables use 922 bytes (45%) of dynamic memory, leaving 1126 bytes for local variables. Maximum is 2048 bytes.
```

If the output shows “fingerprint sensor is not found”, try to look at your connections. If it shows “Found fingerprint sensor”, then type an ID number (1 to 127). Example I choose ID number (1). The most important thing is don’t add any words, only choose the numbers.

Fifth Step

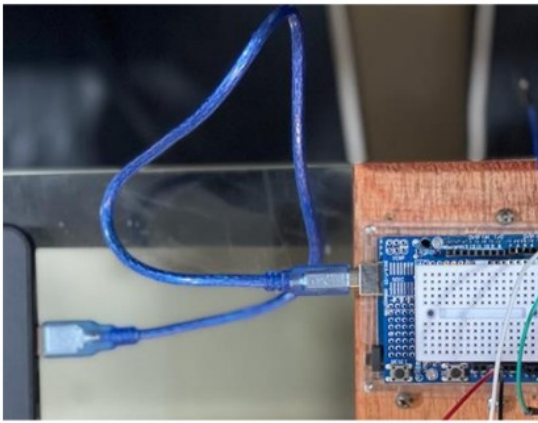


After that, connect the servo motor to the Arduino (UNO) board. Connect the red wire to 5V, the black wire to GND, and the orange wire to (PIN - 9)



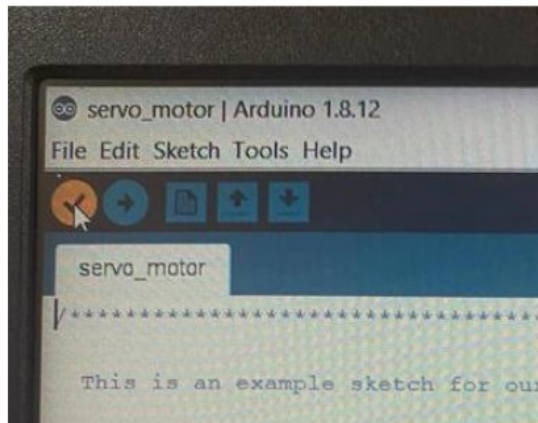
Later on, connect 9V battery to the Arduino (UNO) board. I am connecting the battery because the servo motor needs a 9V supply. Connect the red wire to 5V and the black wire to the GND.

Sixth Step

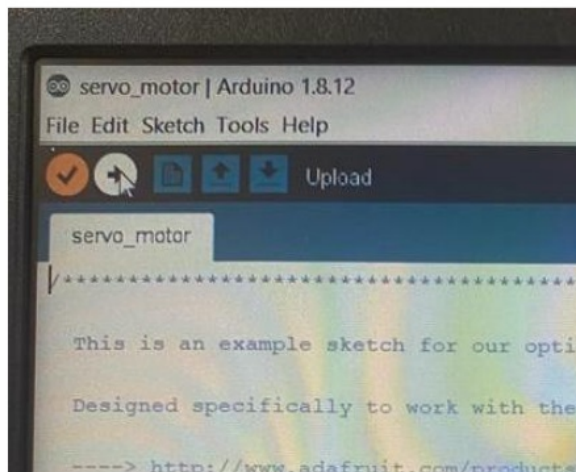


Now, again connect the USB cable to a laptop or PC to upload the coding for the servo motor.

Seventh Step

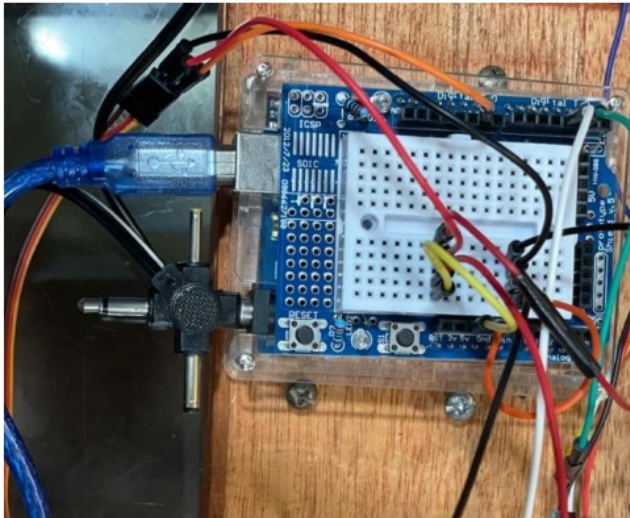


Again, click the on the “verify” ✓

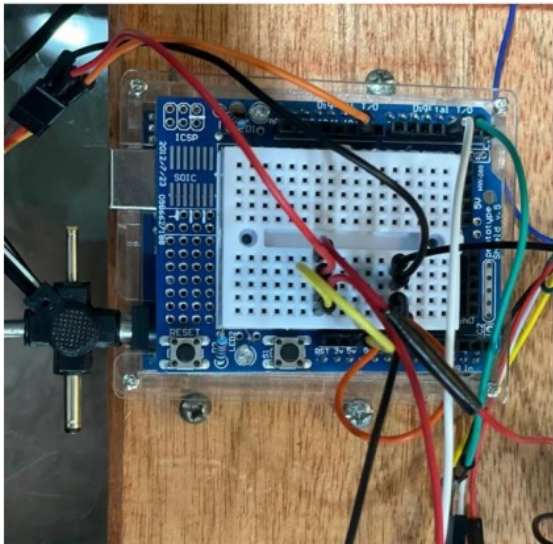


Now again, click on the “Upload” ➡

Eighth Step



Now, plug in the DC Adapter to the Arduino(UNO) board.



Finally, remove the USB cable.

CODING

CODING FOR THE FINGERPRINT SENSOR

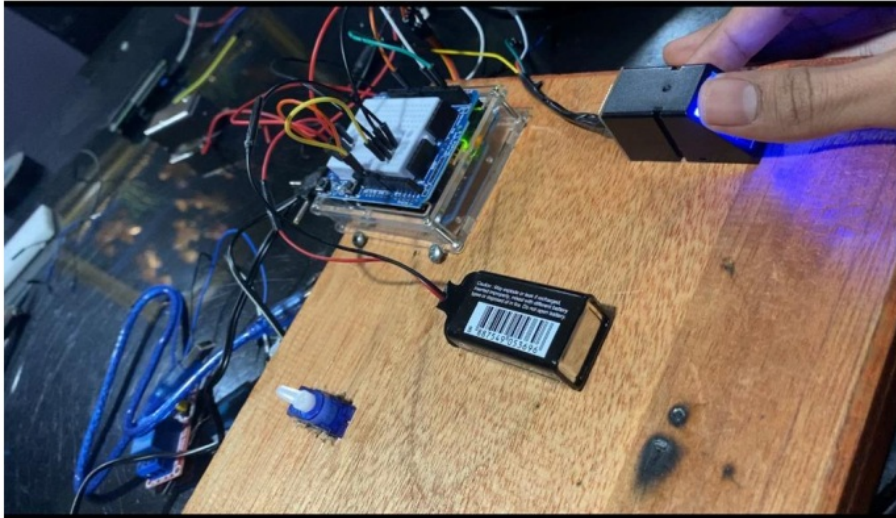
The coding for the fingerprint sensor is already in Arduino. You can go to – tool – manage library – search for “ Adafruit Fingerprint”

CODING FOR THE SERVO MOTOR

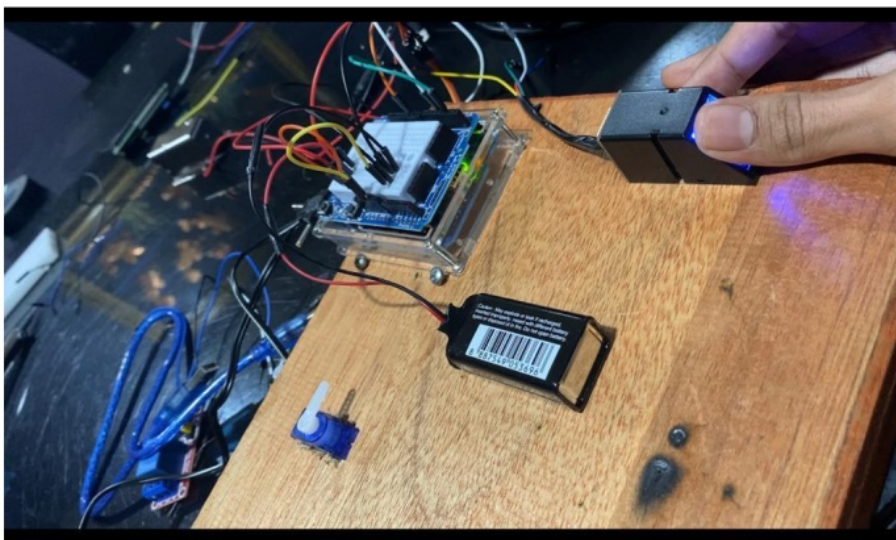
I have uploaded my coding in Github.You can refer my coding there. I had uploaded the link below

<https://github.com/kisheean/Fingerprint-Sensor/blob/main/servo.txt>

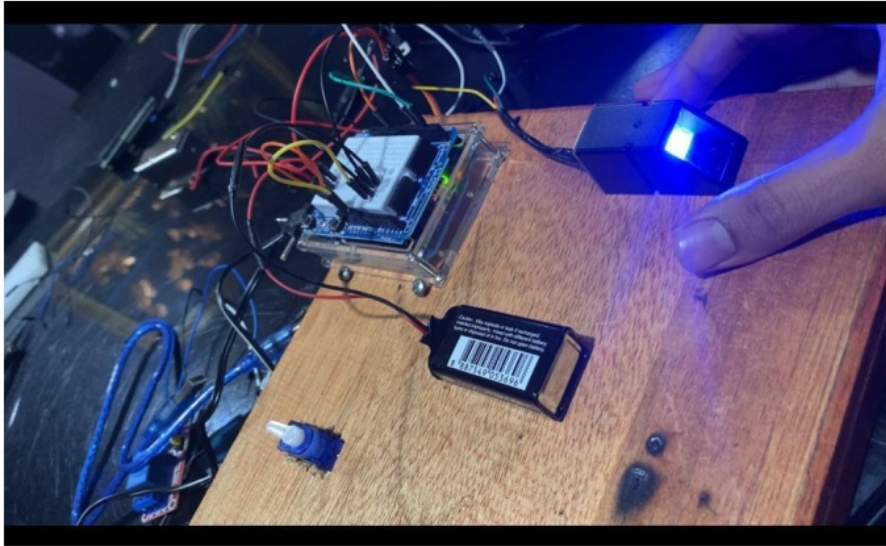
Results and Discussions



Place your finger to the fingerprint sensor to identify your fingerprint.



After, placing your fingerprint the door will be unlocked.



Then, remove your finger and the door will be locked in 5 seconds.

¹
The fingerprint door lock using servo motor provides good solution to the security. A novel architecture for an economic Fingerprint biometric technology is proposed and implemented in this paper. It gives basic idea of how to detect the finger print using R305, Arduino Uno. The cost of this technology is very economical. This project uses low cost off the shelf components, and is based on Arduino platform which is FOSS (Free Open Source Software). The fingerprint door lock with a servo motor offers a successful safety solution. This paper introduces and implements a novel framework for an economic biometric fingerprint technology. It provides a simple idea of how to use R305, Arduino Uno to classify the finger print. The expense of this technology is very economical. This project uses low-cost shelf parts and is based on the FOSS Arduino platform (Free Open Source Software).

YOUTUBE LINK

<https://youtu.be/wAQe6y3mmXE>

Conclusion

In this paper, by taking the idea of biometrics along with the door lock, I tried to solve the safety matter in the door. So, I used fingerprints as a unique key for implementing a program to lock or unlock a door for that purpose. I have addressed the various components using Arduino(UNO). I would like to incorporate my project. I have presented the project's hardware and software specifications. I went through various research papers and then gave a brief on the papers and I came up with an algorithm as to how our method would work after reviewing the papers. I have included a diagram of the project summary and also a cost structure to get a price if it is sold as a commodity. I had also shown a block diagram and a possibly related diagram of the components and provided our project's potential possibilities as well. I posted my project on "Youtube" as well.

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